The present chapter deals with the synthesis and characterization of various bis-ligands (3a-h) namely PBEQ, CPBEQ, TBEQ, BHMPA, BHQMA, NBEQ, BHQPE and BHQME.

### 3.1 Experimental

The bidentate ligand were synthesized by condensation of 5-chloromethyl-8-hydroxyquinoline with various substituted 2,2’-(arylazanediyl) diethanol, in presence of catalytic amount of sodium bicarbonate. The 2,2’-(arylazanediyl) diethanol derivatives (2a-h) are listed in Table 3.1

### 3.2 Materials

All the chemicals used were of analytical grade which were purified by reported method\(^1\). The 5-chloromethyl-8-quinoline and various derivatives of 2,2’-(arylazanediyl) diethanol were prepared by reported method\(^2\) given in Chapter 2.

### 3.3 Synthesis of bis-ligands

A mixture of 2,2’-(arylazanediyl) diethanol (9.06g, 0.05 mole) and 5-chloromethyl -8- hydroxyquinoline (23.0g, 0.1 mole) in 1:2 molar ratio with a catalytic amount of sodium bicarbonate in aqueous solution (5-10 ml) was placed in a 100 mL round bottom flask. The mixture was refluxed in acetone for 2.5 hrs with occasional stirring in heating metal. The resulting mixture was then allowed to stand at room temperature. The greenish product formed was collected by filtration, washed with water and diethyl ether and then dried in vaccum to constant mass and then finally purified by crystallized in chloroform-hexane (70:30) mixture to obtain dark green crystalline product. The preparation of bis-ligand is presented in scheme 3.1.
### Table 3.1 The 2,2’-(arylanediyldiethanol derivatives (2a-h) used for the formation of bis-ligands.

<table>
<thead>
<tr>
<th>No.</th>
<th>Various Derivatives of 2,2’-(arylanediyldiethanol)</th>
<th>General structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>2a</td>
<td>2,2’-(phenylazanediyl) diethanol</td>
<td><img src="image" alt="General structure" /></td>
</tr>
<tr>
<td>2b</td>
<td>2,2’-((3-chlorophenyl) azanediyl)diethanol</td>
<td></td>
</tr>
<tr>
<td>2c</td>
<td>2,2’-(p-tolylanediyldiethanol)</td>
<td></td>
</tr>
<tr>
<td>2d</td>
<td>N-(3-(bis(2-hydroxyethyl)amino) phenyl)acetamide</td>
<td></td>
</tr>
<tr>
<td>2e</td>
<td>N-(3-(bis(2-hydroxyethyl)amino)-4-methoxyphenyl)acetamide</td>
<td></td>
</tr>
<tr>
<td>2f</td>
<td>2,2’-((3-nitrophenyl)azanediyl)diethanol</td>
<td></td>
</tr>
<tr>
<td>2g</td>
<td>1-(4-(bis (2-hydroxyethyl) amino) phenyl) ethanone</td>
<td></td>
</tr>
<tr>
<td>2h</td>
<td>1-(2-(bis (2-hydroxyethyl) amino) -4-methylphenyl) ethanone</td>
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</tbody>
</table>

Where \( R = \) H, 
- \( = 3-\text{Cl} \), 
- \( = 4-\text{CH}_3 \), 
- \( = 3-\text{NHCOCH}_3 \) 
- \( = 2-\text{OCH}_3 \), 
- \( 5-\text{NHCOCH}_3 \) 
- \( = 3-\text{NO}_2 \) 
- \( = 4-\text{COCH}_3 \) 
- \( = 2-\text{COCH}_3, 5-\text{CH}_3 \)
Where $R = \text{H, } 4\text{-CH}_3, 2\text{-OCH}_3, 2\text{-COCH}_3$ = $3\text{-Cl, } 3\text{-NHCOCH}_3, 5\text{-NHCOCH}_3, 3\text{-NO}_2, 2\text{-COCH}_3, 5\text{-CH}_3$

**Scheme 3.1** Preparation of bis-ligands (3a-h) from 2,2'- (arylazanediyl)diethanol and CMQ

The structures of all the compounds **(3a-h)** were confirmed by analytical and spectral data.
\[ \text{(3a) 5,5'-(((phenylazanediyl) bis (ethane-2,1- diyl) bis(oxy)) Bis (methylene)) bis (quinolin-8-ol) [PBEQ]} \]

\[
\begin{align*}
\text{Molecular Formula} : & \quad \text{C}_{30}\text{H}_{29}\text{N}_3\text{O}_4 \\
\text{Molecular weight} : & \quad 495.57 \text{ gram/mole} \\
\text{Melting Point} : & \quad 237^\circ\text{C} \text{ (Uncorrected)} \\
\text{Yield} : & \quad 70\% \\
\text{Elemental analysis} : & \quad \%	ext{C} \quad \%	ext{H} \quad \%	ext{N} \\
& \quad \text{Calculated} \quad 72.71 \quad 5.90 \quad 8.48 \\
& \quad \text{Found} \quad 72.89 \quad 5.89 \quad 8.45 \\
\text{\textsuperscript{1}H NMR (400 MHz, DMSO-}d_6 \text{) } \delta_{\text{H}} \text{ (ppm)} : & \quad \text{3.74 (4H, triplet, 2 x CH}_2\text{), 4.18 (4H, triplet, 2 x CH}_2\text{), 4.79 (4H, singlet, 2 x CH}_2\text{), 6.80-8.87 (15H, multiplet, Ar-H), 9.72(2H, broad singlet, 2 x OH, D}_2\text{O exchangeable).} \\
\text{\textsuperscript{13}C NMR (100 MHz, DMSO-}d_6 \text{) } \delta_{\text{c}} \text{ (ppm)} : & \quad \text{53.59(-CH}_2\text{-), 58.44(-CH}_2\text{-), 58.54(-CH}_2\text{), 110.45(CH), 111.05(CH), 111.08(CH), 122.14(CH), 123.85(CH), 126.61(C), 127.61(CH), 128.05(CH), 133.11(C), 134.27(C), 148.15(CH), 148.20(C), 152.40(C).} \\
\text{DEPT-135 :} & \quad \text{53.59(-CH}_2\text{-), 58.45(-CH}_2\text{-), 58.54(-CH}_2\text{-), 110.44, 111.08, 111.09, 122.14, 123.79, 127.65, 128.05, 148.16.} \\
\text{IR (cm}\textsuperscript{-1}) : \quad & \quad \nu_{\text{max}} \text{ 3405(O-H stretching), 3042(aromatic C-H stretching), 2915(aliphatic C-H stretching), 1609 and 1542(aromatic C=C and C=N stretchings), 748 and 688 (Monosubstituted frequency).}
\end{align*}
\]
Chapter 3

(3b) 5, 5' - (((((3-chlorophenyl) azanediyl) bis (ethane-2,1-diyd)) bis (oxy)) bis (methylene)) bis (quinolin-8-ol) [CPBEQ]

![Chemical structure of CPBEQ](image)

**Molecular Formula:** \( C_{30}H_{28}ClN_{3}O_{4} \)

**Molecular weight:** 530.01 gram/mole

**Melting Point:** 241°C (Uncorrected)

**Yield:** 72%

**Elemental analysis:**

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</table>

**\(^1\)H NMR (400 MHz, DMSO-\(d_6\)) \( \delta_H \) (ppm):**

\( 3.72 \) (4H, triplet, 2 x CH\(_2\)), \( 4.19 \) (4H, triplet, 2 x CH\(_2\)), \( 4.79 \) (4H, singlet, 2 x CH\(_2\)), 6.79-8.87 (14H, multiplet, Ar-H), 9.65 (2H, broad singlet, 2 x OH, D\(_2\)O exchangeable).

**\(^{13}\)C NMR (100 MHz, DMSO-\(d_6\)) \( \delta_C \) (ppm):**

\( 53.62(-\text{CH}_2-), \ 58.40(-\text{CH}_2-), \ 58.59(-\text{CH}_2-), \ 110.48(\text{CH}), \ 111.09(\text{CH}), \ 111.12(\text{CH}), \ 122.26(\text{CH}), \ 123.94(\text{CH}), \ 126.72(\text{CH}), \ 127.84(\text{C}), \ 128.13(\text{CH}), \ 131.62(\text{CH}), \ 133.19(\text{C}), \ 134.36(\text{C}), \ 139.33(\text{C}), \ 148.22(\text{CH}), \ 148.45(\text{C}), \ 152.52(\text{C}). \)

**DEPT-135:**

\( 53.62(-\text{CH}_2-), \ 58.38(-\text{CH}_2-), \ 58.60(-\text{CH}_2-), \ 110.45, \ 111.08, \ 111.10, \ 122.14, \ 123.92, \ 126.69, \ 128.12, \ 131.60, \ 148.46. \)

**IR (cm\(^{-1}\)):**

\( \nu_{\text{max}} \) 3410(O-H stretching), 3062(aromatic C-H stretching), 2912(aliphatic C-H stretching), 1614 and 1540(aromatic C=C and C=N stretchings).
(3c) 5, 5’-(((p-tolylazanediyl) bis (ethane-2, 1- diyl)) bis (oxy)) bis (methylene) bis (quinolin-8-ol) [TBEQ]

\[
\begin{align*}
\text{CH}_3 & \quad \text{H}_2C \quad \text{N} \quad \text{O} \\
\text{O} & \quad \text{H}_2C \quad \text{N} \quad \text{O} \\
\text{OH} & \quad \text{H}_2C \quad \text{OH}
\end{align*}
\]

**Molecular Formula:** $C_{31}H_{31}N_3O_4$

**Molecular weight:** 509.60 gram/mole

**Melting Point:** 232°C (Uncorrected)

**Yield:** 73%

**Elemental analysis:**

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**$^1H$ NMR (400 MHz, DMSO-$d_6$) $\delta$ (ppm):**

- 2.35 (3H, singlet, CH$_3$), 3.72 (4H, triplet, 2 x CH$_2$), 4.17 (4H, triplet, 2 x CH$_2$), 4.80 (4H, singlet, 2 x CH$_2$), 6.65-8.86 (14H, multiplet, Ar-H), 9.74 (2H, broad singlet, 2 x OH, D$_2$O exchangeable).

**$^{13}C$ NMR (100 MHz, DMSO-$d_6$) $\delta$ (ppm):**

- 21.60(-CH$_3$), 53.75(-CH$_2$), 58.66(-CH$_2$), 58.74(-CH$_2$), 111.06(CH), 111.10(CH), 115.45(CH), 122.12(CH), 127.73(C), 128.27(CH), 129.18(C), 129.49(CH), 133.34(C), 139.36(C), 148.22(C), 148.39(CH), 152.42(C).

**DEPT-135:**

- 21.61(-CH$_3$), 53.75(-CH$_2$), 58.65(-CH$_2$), 58.70(-CH$_2$), 111.06, 111.11, 115.45, 122.14, 128.26, 129.48, 148.35.

**IR (cm$^{-1}$):**

- $\nu_{max}$ 3406(O-H stretching), 3063(aromatic C-H stretching), 2926(aliphatic C-H stretching), 1602 and 1536(aromatic C=C and C=N stretchings), 816(p-disubstituted frequency).
(3d) \( N - (3- \text{(bis} (2- \text{((8} \text{– hydroxyquinolin} -5- \text{yl} \text{methoxy} \text{ethyl}) \text{amino}) \text{phenyl}) \text{acetamide} \ [\text{BHMPA}]

\[
\text{NHCOCH}_3
\]

\[
\text{H}_2\text{C}_6\text{N}_4\text{O}_5
\]

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<td>Found</td>
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<td>5.82</td>
<td>10.15</td>
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\(^1H\) NMR (400 MHz, DMSO-\(d_6\)) \( \delta_H \) (ppm):
- 2.05 (3H, singlet, CH\(_3\)), 3.73 (4H, triplet, 2 x CH\(_2\)).
- 4.18 (4H, triplet, 2 x CH\(_2\)), 4.80 (4H, singlet, 2 x CH\(_2\)), 6.68-8.86 (15H, multiplet, Ar-H), 9.73(2H, broad singlet, 2 x OH, D\(_2\)O exchangeable).

\(^13C\) NMR (100 MHz, DMSO-\(d_6\)) \( \delta_C \) (ppm):
- 24.89(-CH\(_3\)), 53.68(-CH\(_2\)-), 58.12(-CH\(_2\)-), 58.28(-CH\(_2\)-), 111.10(CH), 111.26(CH), 115.52(CH), 122.23(CH), 126.87(CH), 127.82(CH), 128.30(C), 129.14(C), 129.36(CH), 133.38(C), 139.34(C), 148.23(C), 148.43(CH), 149.26(CH), 153.51(C), 166.93(C).

DEPT-135:
- 24.89(-CH\(_3\)), 53.68(-CH\(_2\)-), 58.02(-CH\(_2\)-), 58.12(-CH\(_2\)-), 111.10, 111.28, 115.45, 122.23, 126.85, 127.84, 129.40, 148.41, 149.32.

IR (cm\(^{-1}\)):
- \( \nu_{max} \) 3412(O-H stretching), 3057(aromatic C-H stretching), 2945(aliphatic C-H stretching), 1617 and 1553(aromatic C=C and C=N stretchings).
(3e) N-(3-(bis(2-((8-hydroxyquinolin-5-yl)methoxy)ethyl))amino)-4-methoxyphenyl)acetamide [BHQMA]

Molecular Formula : $\text{C}_{33}\text{H}_{34}\text{N}_{4}\text{O}_{6}$
Molecular weight : 582.65 gram/mole
Melting Point : 231°C (Uncorrected)
Yield : 71%

Elemental analysis :

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<tr>
<td>Found</td>
<td>68.01</td>
<td>5.89</td>
<td>9.60</td>
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</table>

$^1$H NMR (400 MHz, DMSO-$d_6$) $\delta_H$ (ppm) :

- 2.04 (3H, singlet, CH$_3$)
- 3.74 (4H, triplet, 2 x CH$_2$)
- 3.84 (3H, singlet, OCH$_3$)
- 4.18 (4H, triplet, 2 x CH$_2$)
- 4.80 (4H, singlet, 2 x CH$_2$)
- 6.78-8.86 (14H, multiplet, Ar-H)
- 9.73 (2H, broad singlet, 2 x OH, D$_2$O exchangeable).

$^{13}$C NMR (100 MHz, DMSO-$d_6$) $\delta_C$ (ppm) :

- 24.05(-CH$_3$)
- 53.42(-CH$_2$)
- 55.20(-CH$_3$)
- 58.15(-CH$_2$)
- 58.32(-CH$_2$)
- 111.18(CH)
- 111.22(CH)
- 115.64(CH)
- 122.32(CH)
- 126.84(CH)
- 126.92(CH)
- 128.36(C)
- 129.50(C)
- 131.72(CH)
- 136.93(C)
- 139.20(C)
- 146.32(C)
- 149.48(C)
- 149.60(CH)
- 153.42(C)
- 167.94(C).

DEPT-135 :

- 24.05(-CH$_3$)
- 53.44(-CH$_2$)
- 55.20(-OCH$_3$)
- 58.15(-CH$_2$)
- 58.42(-CH$_2$)
- 111.12, 111.24, 115.65, 122.33, 126.80, 126.92, 131.71, 149.65.

IR (cm$^{-1}$) :

- $\nu_{\text{max}}$ 3442(O-H stretching), 3032(aromatic C-H stretching), 2956(aliphatic C-H stretching), 1620 and 1546(aromatic C=C and C=N stretchings).
(3f) 5,5’-(((3- nitrophenyl) azanediyl) bis (ethane-2,1-diyl) bis (oxy) bis (methylene)) bis (quinolin-8-ol) [NBEQ]

\[
\begin{align*}
\text{O} & \quad \text{NO}_2 \\
\text{H}_2\text{C} & \quad \text{N} & \quad \text{O} \\
\text{H}_2\text{C} & \quad \text{OH} & \quad \text{OH}
\end{align*}
\]

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<td>Calculated 66.66</td>
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<td>(^1\text{H} \text{NMR (400 MHz, DMSO-}d_6\text{)} \delta_\text{H (ppm)} :</td>
<td>3.73 (4H, triplet, 2 x CH(_2)), 4.17 (4H, triplet, 2 x CH(_2)), 4.79 (4H, singlet, 2 x CH(_2)), 7.05-8.85 (14H, multiplet, Ar-H), 9.73(2H, broad singlet, 2 x OH, D(_2)O exchangeable).</td>
</tr>
<tr>
<td>(^1\text{C} \text{NMR (100 MHz, DMSO-}d_6\text{)} \delta_\text{c (ppm)} :</td>
<td>54.15(\text{-CH}_2\text{-}), 58.63(\text{-CH}_2\text{-}), 58.79(\text{-CH}_2\text{-}), 109.81(\text{CH}), 111.10(\text{CH}), 111.29(\text{CH}), 114.12(\text{CH}), 122.32(\text{CH}), 126.67(\text{C}), 127.75(\text{CH}), 128.03(\text{CH}), 131.50(\text{C}), 134.32(\text{C}), 138.21(\text{C}) 139.12(\text{CH}), 148.15(\text{CH}), 148.22(\text{C}), 153.07(\text{C}).</td>
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<tr>
<td>DEPT-135</td>
<td>54.16(\text{-CH}_2\text{-}), 58.61(\text{-CH}_2\text{-}), 58.79(\text{-CH}_2\text{-}), 109.83 111.12, 111.29, 114.11, 122.33, 127.73, 128.04, 139.10, 148.15.</td>
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<tr>
<td>IR (cm(^{-1}))</td>
<td>( \nu_{\text{max}} ) 3417(O-H stretching), 3110(aromatic C-H stretching), 2930(aliphatic C-H stretching), 1621 and 1551(aromatic C=C and C=N stretchings).</td>
</tr>
</tbody>
</table>

\[\text{Department of chemistry, S.P.U.} \quad 79\]
(3g) 1-(4-(bis(2-((8-hydroxyquinolin-5-yl) methoxy) ethyl) amino) phenyl) ethanone [BHQPE]

Molecular Formula : $C_{32}H_{31}N_3O_5$
Molecular weight : 537.61 gram/mole
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Yield : 73%
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$^1$H NMR (400 MHz, DMSO-$d_6$) $\delta_H$ (ppm) :

- 2.50(3H, singlet, CH$_3$), 3.74(4H, triplet, 2 x CH$_2$), 4.18 (4H, triplet, 2 x CH$_2$), 4.79 (4H, singlet, 2 x CH$_2$), 6.86-8.86 (14H, multiplet, Ar-H), 9.70(2H, broad singlet, 2 x OH, D$_2$O exchangeable).

$^{13}$C NMR (100 MHz, DMSO-$d_6$) $\delta_C$ (ppm) :

- 24.50(-CH$_3$), 54.12(-CH$_2$), 58.72(-CH$_2$), 58.84(-CH$_2$), 111.12(CH), 122.05(CH), 126.52(CH), 126.71(CH), 127.60(CH), 131.46(C), 131.68(CH), 137.83(C), 147.24(CH) 147.41(C), 152.84(C), 153.30(C), 165.15(C).

DEPT-135 :

- 24.50(-CH$_3$), 54.13(-CH$_2$), 58.70(-CH$_2$), 58.82(-CH$_2$), 111.14, 122.05, 126.54, 126.70, 129.63, 131.68, 147.25.

IR (cm$^{-1}$) :

$\nu_{\text{max}}$ 3421(O-H stretching), 3068(aromatic C-H stretching), 2932(aliphatic C-H stretching), 1610 and 1534(aromatic C=C and C=N stretchings), 814(p-disubstituted frequency).
(3h) 1-(2-(bis(2-((8-hydroxyquinolin-5-yl) methoxy) ethyl) amino)-4-methylphenyl) ethanone [BHQME]

![Chemical structure](image)

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<td>4.18 (4H, triplet, 2 x CH_{2})</td>
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<td>4.81 (4H, singlet, 2 x CH_{2})</td>
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<td>6.66-8.86 (13H, multiplet, Ar-H)</td>
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<tr>
<td>9.71(2H, broad singlet, 2 x OH, D_{2}O exchangeable)</td>
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<td><strong>{^{13}}C NMR (100 MHz, DMSO-d_{6})</strong> {^\delta_C (ppm)}</td>
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</tr>
<tr>
<td>22.42(-CH_{3}), 28.20(-CH_{3}), 54.12(-CH_{2}), 59.24(-CH_{2}), 59.35(-CH_{2}), 111.71(CH), 113.68(CH), 122.12(CH), 122.23(CH), 124.32(CH), 128.70(C), 128.81(CH), 131.57(C), 131.61(CH), 139.38(C), 140.52(C), 146.50(C), 148.82(CH), 151.21(C), 152.23(C), 168.12(C).</td>
<td></td>
</tr>
<tr>
<td><strong>DEPT-135</strong></td>
<td></td>
</tr>
<tr>
<td>22.42(-CH_{3}), 28.22(-CH_{3}), 54.13(-CH_{2}), 59.26(-CH_{2}), 59.34(-CH_{2}), 111.72, 113.69, 122.10, 122.25, 124.34, 128.81, 131.60, 148.83.</td>
<td></td>
</tr>
<tr>
<td><strong>IR (cm^{-1})</strong></td>
<td>\nu_{max} 3419(O-H stretching), 3067(aromatic C-H stretching), 2921(aliphatic C-H stretching), 1611 and 1544(aromatic C=C and C=N stretchings).</td>
</tr>
</tbody>
</table>
Fig. 3.1 The $^1$H NMR spectrum of compound 3a

Fig. 3.2 The $^{13}$C NMR spectrum of compound 3a
Fig. 3.3 DEPT-135 of compound 3a

Fig. 3.4 FT-IR of compound 3a
**Fig. 3.5** The $^1$H NMR spectrum of compound 3b

**Fig. 3.6** The $^{13}$C NMR spectrum of compound 3b
Fig. 3.7 DEPT-135 of compound 3b

Fig. 3.8 FT-IR of compound 3b
Fig. 3.9 The $^1$H NMR spectrum of compound 3c

Fig. 3.10 The $^{13}$C NMR spectrum of compound 3c
Fig. 3.11 DEPT-135 of compound 3c

Fig. 3.12 FT-IR of compound 3c
Fig. 3.13 The $^1$H NMR spectrum of compound 3d

Fig. 3.14 The $^{13}$C NMR spectrum of compound 3d
**Fig. 3.15** DEPT-135 of compound 3d

**Fig. 3.16** FT-IR of compound 3d
Fig. 3.17 The $^1$H NMR spectrum of compound 3e

Fig. 3.18 The $^{13}$C NMR spectrum of compound 3e
**Fig. 3.19** DEPT-135 of compound 3e

**Fig. 3.20** FT-IR of compound 3e
**Fig. 3.21** The $^1$H NMR spectrum of compound 3f

**Fig. 3.22** The $^{13}$C NMR spectrum of compound 3f
**Fig. 3.23** DEPT-135 of compound 3f

**Fig. 3.24** FT-IR of compound 3f
**Fig. 3.25** The $^1$H NMR spectrum of compound 3g

**Fig. 3.26** The $^{13}$C NMR spectrum of compound 3g
**Fig. 3.27** DEPT-135 of compound 3g

**Fig. 3.28** FT-IR of compound 3g
Fig. 3.29 The $^1$H NMR spectrum of compound 3h

Fig. 3.30 The $^{13}$C NMR spectrum of compound 3h
Fig. 3.31 DEPT-135 of compound 3h

Fig. 3.32 FT-IR of compound 3h
3.4 Results and Discussion

The $^1$H NMR spectrum of compound 3a (Fig 3.1) showed fifteen aromatic protons of quinoline and 2,2’-(phenylazanediy1) diethanol moieties which were observed between 6.80-8.87 δ. The signal appeared as a singlet at 4.79 δ (4H), which is assigned to two –CH$_2$- protons. The signal appeared as a triplet at 3.74 δ and 4.18 δ (8H) is assigned to two -CH$_2$-CH$_2$- protons. A broad singlet observed at 9.72 δ (2H) is assigned to two aromatic hydroxyl protons, which is confirmed by D$_2$O exchange experiment.

The $^{13}$C NMR spectrum of compound 3a (Fig 3.2) showed signals at 53.59 (-CH$_2$-), 58.44 (-CH$_2$-), 58.54 (-CH$_2$-), 110.45, 111.05, 111.08, 122.14, 123.85, 126.61, 127.61, 128.05, 133.11, 134.27, 148.15, 148.20, 152.40 δ (Ar-C). The compound is having sixteen different types of carbon atoms and hence expected number of signals are observed. The DEPT-135 spectrum (Fig 3.3) showed signals at 53.59, 58.45, 58.54, 110.44, 111.08, 111.09, 122.14, 123.79, 127.65, 128.05 and 148.16 δ and inverted signals at 53.59, 58.45, and 58.54 δ, which are due to three symmetrical (-CH$_2$-) carbons. The signals appeared at 110.44, 111.08, 111.09, 122.14, 123.79, 127.65, 128.05 and 148.16 δ are due to eight (CH) carbons.

The IR spectrum of 3a (Fig 3.4) showed a broad band at 3405 cm$^{-1}$ due to –OH stretching vibration. Weak band at 2915 and 2835 cm$^{-1}$ are attributed to asymmetric and symmetric stretching vibrations of methylene groups. Band at 1576 cm$^{-1}$ is due to the C=N stretching$^{3-4}$. The C-O stretching in the ligand may be traced to the absorptions at 1369 and 1246 cm$^{-1}$. The band at 1230 cm$^{-1}$ in the ligand is assigned to O-H bending of the phenolic moiety. In addition, the spectrum of compound 3a has many characteristic absorption bands which are identical to those that occur in MHQ$^{5-6}$. 

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References


